Development, Installation, Testing and Demonstration of a Combined Cooling Heating & Power System at Floyd Bennett Field

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3rd Annual National CHP Roadmap - October 24, 2002

CHP Project at Floyd Bennett Field

- Floyd Bennett Field
- Project Development
- Description of Floyd Bennett Field Project
- Design Issues
- Project Status

Floyd Bennett Field

- Part of Gateway National Recreation Area
- Only National Park with Camping in New York City
- Air Field Was Historically Important in the 1930s and 1940s
- Park Includes Pine Forests and Wetlands
- NPS Center for Sustainable Design in Eastern Half of the U.S.

Project Development

- Facility Energy Audit Performed
- Park is pursuing adaptive re-use of existing buildings
- Interest in Energy efficiency Projects
- Interest in Public Education and Demonstration

Floyd Bennett Field

- Landsberg Engineering, Inc. - Project Manager
- Originally 6 30-kW Capstone Microturbines
- Heat recovery: space heating and cooling
- Funding:
  - NYSERDA: $425,000
  - National Park Service: $200,000
  - KeySpan Energy R&D: $100,000
  - Oak Ridge National Lab $100,000 - In-Kind
  - Office of Power and Technology: $50,000
  - FEMP $50,000

Building Description

- Two story 17,000 sf
- Building to be developed as a Human Ecology Laboratory
- Requires 40 tons of cooling
- Heating system is 650 MBH output
- 60# gas available at building line
- Existing hvac system is 4-pipe fancoil

Design Issues

- 30 kW vs 60 kW Turbines
- Water Chiller vs Direct-Fired Chiller
- Ducting Through Heat Exchanger to Chiller
- Stand Alone Operation

Design Issues
30 kW vs 60 kW Turbines

- 30 kW Advantages
  - No compressors needed - 60 psi gas available
  - Longer experience with unit (but being phased out)

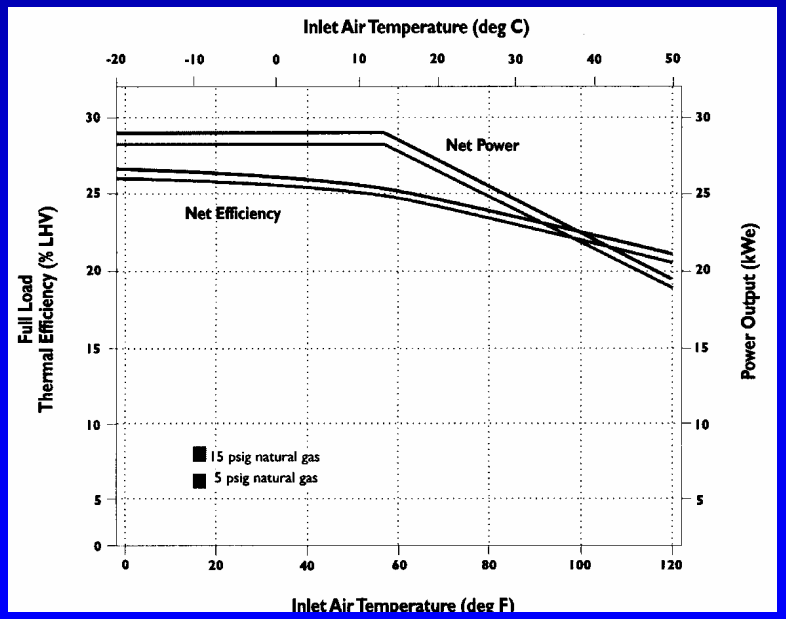
Design Issues
30 kW vs 60 kW Turbines

- 60 kW Advantages
  - Produces 60 kW while powering compressors
  - Lower installed cost including compressors
  - Peak power output up to to 82F vs 58F outside air temperature for 30 kW
  - 2.5% more power production in NYC climate
  - Lower maintenance costs

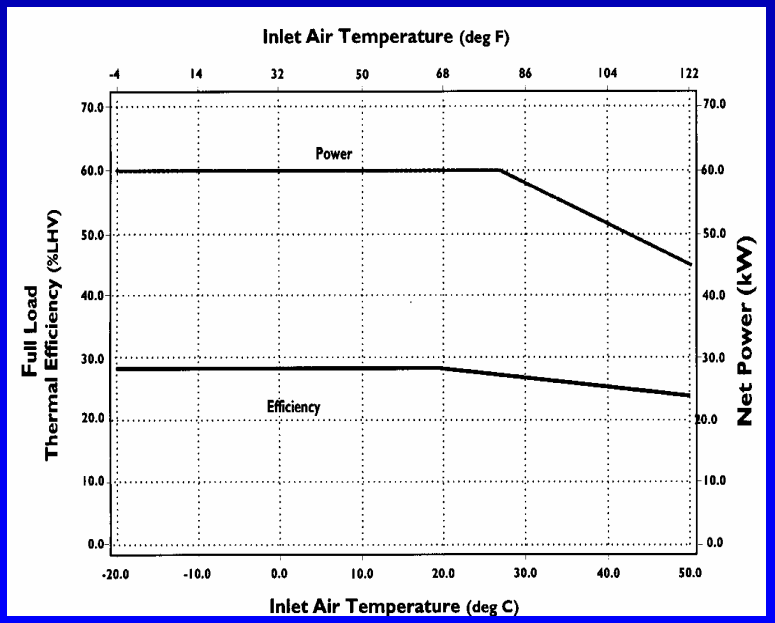
Design Issues
30 kW vs 60 kW Turbines

Turbine Performance

30 kW



60 kW



Design Issues
Water Chiller vs Direct-Fired Chiller

- Direct-Fired Chiller
  - Eliminates need for heat exchanger for cooling
  - Can eliminate need for heat exchangers in new building (180F water needed for heating)
  - Broad Direct-Fired Chiller less costly than Yazaki, but air damper makes pricing roughly equal

Design Issues
Water Chiller vs Direct-Fired Chiller

- Water Chiller
  - Requires heat exchanger for operation
  - 10-ton Yazaki units used to date expensive to buy and install
  - 40-ton Yazaki more costly than Broad direct-fired unit
- Direct-Fired selected - advances state-of-art

60 kW Capstone with Broad Chiller

Courtesy of Aris Marantan, and The University of Maryland

Design Issues
Ducting Exhaust To Chiller

- Ducting Through Heat Exchanger
  - Less complex system
  - With Unifin HX adds 4” water back pressure (8” maximum for turbine) - in-line fan needed
  - Use Cain heat exchanger - less back pressure
- Ducting Around Heat Exchanger
  - More costly and complex system
- Probably Duct Through Cain Heat Exchanger

Project Status

- Pre-Monitoring Completed
- Design Nearing Completion
- Construction to Begin in November
- Startup Planned for Spring 2003
- Visitor's Display Planned